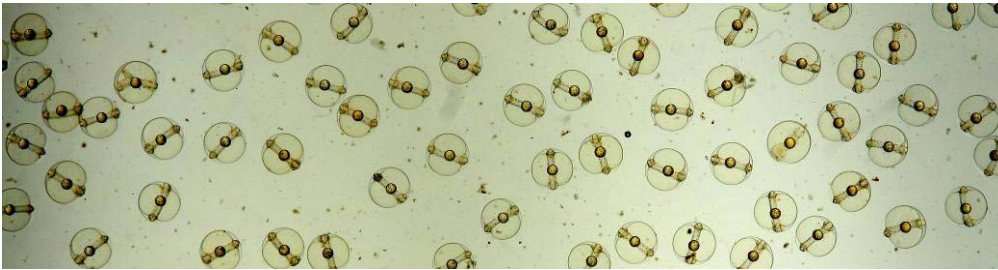


Atlantic mackerel and horse mackerel egg survey: Dutch participation May and June 2010

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Report number C078/10



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Summary

In 2010 the international Atlantic mackerel and horse mackerel egg survey was performed. This year the entire spawning area was sampled by 10 institutes from 9 different countries: Faeröer Islands, Germany, Iceland, Ireland, Norway, Portugal, Scotland, Spain and The Netherlands. Sampling started in February along the Portuguese coast and continued until July west of Scotland. The Dutch institute IMARES participated in the survey in May and June on board 'RV Tridens'. IMARES covered the area of the Northern Bay of Biscay and Southern Celtic Sea once each month.

In both months a total of 234 ichthyoplankton samples were taken with a Gulf VII plankton torpedo with a Seabird CTD mounted on top. Also adult fish samples for the estimation of fecundity and atresia were taken using a pelagic trawl.

The survey was successful and IMARES managed to sample planned stations. However, numbers of both mackerel and horse mackerel eggs found in the samples were lower compared to 2007, despite the fact that the adult fish caught still showed signs of upcoming spawning or recent spawning markers. Numbers of mackerel and horse mackerel were higher in June compared to May. Highest numbers were found around the 200 m depth contour.

Temperature at the surface and 20 m depth were higher in June compared to May. Salinity at 20 m depth was the same in both periods.

1 Introduction

Every three years an international Atlantic survey is carried out by different European institutes to monitor the spatial and seasonal distribution of Atlantic mackerel and horse mackerel. During this survey mackerel and horse mackerel eggs are sampled using a plankton torpedo or bongo nets. The survey covers the whole spawning area and season. It starts along the Portuguese coast in February and continues until July when the waters west of Scotland are sampled.

The mackerel and horse mackerel egg survey is coordinated by the ICES working group for mackerel and horse mackerel egg surveys (WGMEGS).

England and France started the egg survey in the western area in 1977. The Netherlands participates since 1983. Nowadays participating countries and sampling area have expanded. In 2010 the following countries participated in this survey: Faeröer Islands, Germany, Iceland, Ireland, Norway, Portugal, Scotland, Spain and The Netherlands.

2 Aim of the project

The purpose of this project is to monitor the spatial distribution and seasonal patterns in the appearance of mackerel and horse mackerel eggs in the eastern Atlantic. IMARES, on board the 'RV Tridens' sampled part of the Bay of Biscay and the Celtic Sea in both May (period 4) and June (period 5) using a Gulf VII plankton sampler. Also pelagic hauls were carried out to collect adult mackerel and horse mackerel samples to estimate fecundity. These data will be combined to provide a fisheries-independent estimate of the spawning stock biomass of western mackerel and horse mackerel.

3 Methods

3.1 Gears

The sampling of the fish eggs and larvae is carried out with a "High Speed Plankton Sampler Gulf VII" (Fig. 3.1) (referred to as 'torpedo' in the remainder of the report) with a plankton net with mesh size 280 μm . If clogging of the net occurs due to large amounts of phytoplankton the complete net is changed for one with a 500 μm mesh size. A small skrips-depressor of 35 kg is attached to the torpedo. The amount of water filtered during each haul is measured using an internal Valeport electronic flowmeter. On the frame an external flowmeter is also mounted, to check for blowing of the net due to large amounts of phyto- and microzooplankton in the water. On top of the torpedo a Seabird 911plus CTD with a Benthos PSI 916 altimeter is mounted to monitor live view the depth of the torpedo in the water column and the bottom under the torpedo. The CTD also measures temperature and salinity.

Adult fish samples are taken using the pelagic 5600 trawl.



Figure 3.1. Gulf VII plankton torpedo.

3.2 Fishing method

This survey is carried out on board the 'RV Tridens'. The speed during fishing with the plankton torpedo is 5 knots through the water. At each station a 'double oblique' haul is performed (Fig. 3.2). The Gulf VII sampler is lowered to 5 m above the sea floor or to 200 m depth maximum. To ensure enough water is filtered during the haul, haul duration should at least be 10 minutes. At stations with low depth a double 'double oblique' is performed without the torpedo breaking the surface of the water. In this way each 10 meters of the water column are sampled 1 minute going down and going up. In case of a thermocline stronger than 2.5 $^{\circ}\text{C}$ over 10 meters the sampler is lowered to 20 meters below the thermocline.

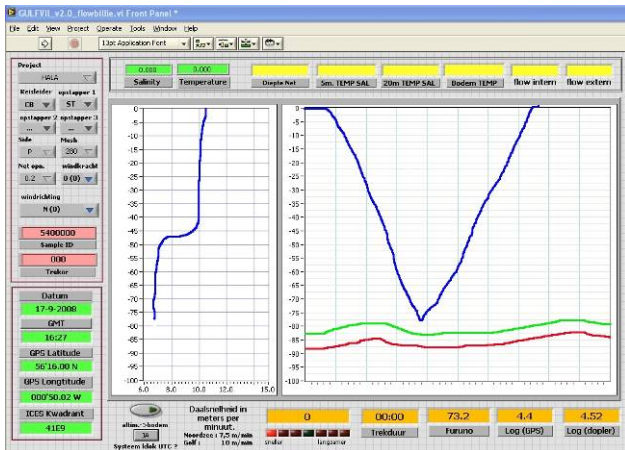


Figure 3.2. Illustration of an oblique haul in the Labview program.

3.3 Sampling grid

IMARES is asked by WGMEGS to sample part of the Bay of Biscay and Celtic Sea, both in May (period 4) and June (period 5) (Fig. 3.3.1 & 3.3.2). Each half ICES rectangle a plankton sample is taken. Each week two pelagic trawl hauls were planned around the 200 m depth contour (Fig. 3.3). A pelagic haul is performed when fish is visible on the echo sounders.

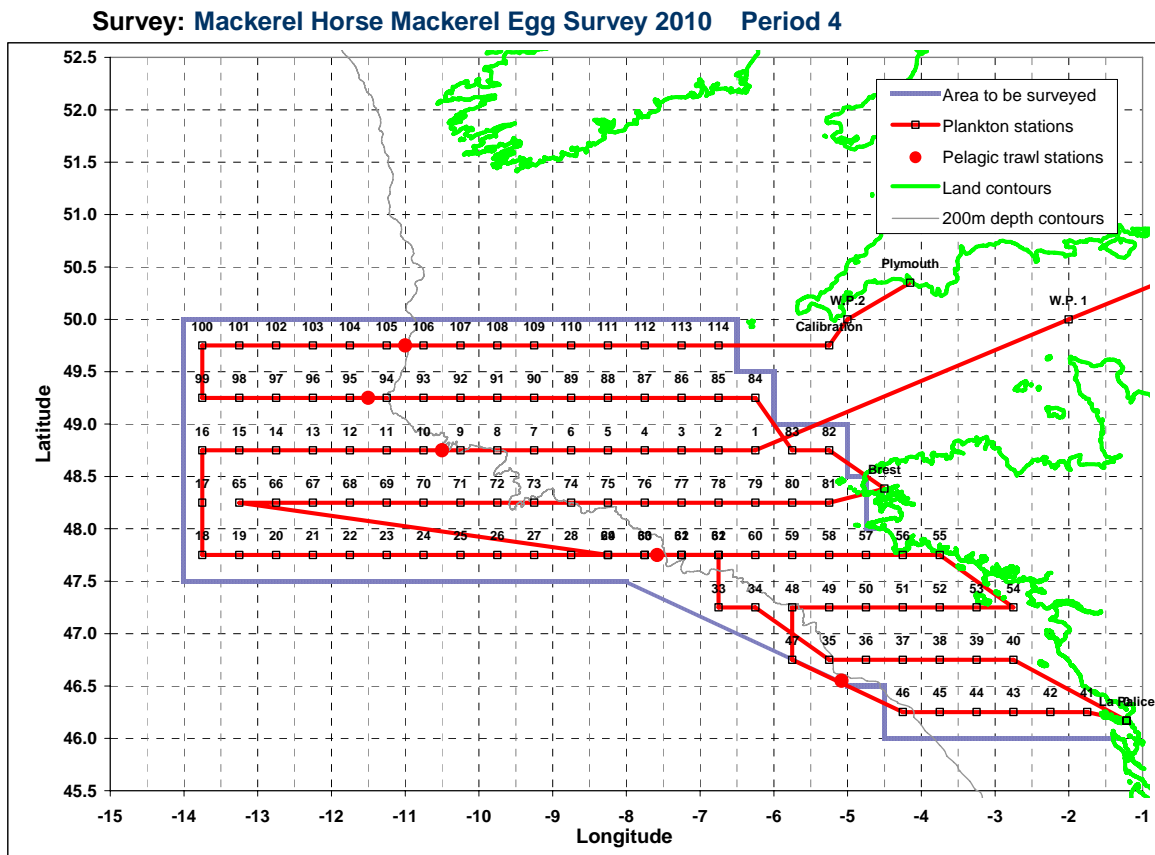


Figure 3.3.1. Planned sampling grid in May (Period 4).

Survey: Mackerel Horse Mackerel Egg Survey 2010 Period 5

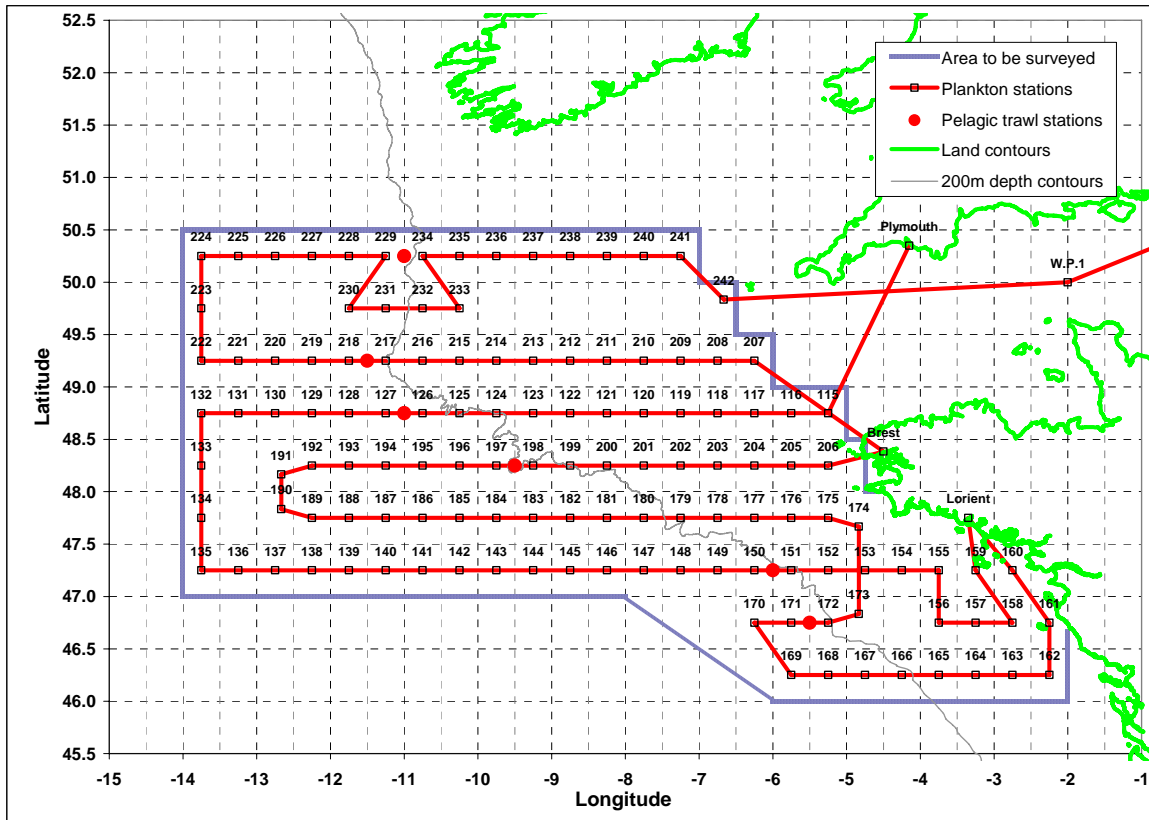


Figure 3.3.2. Planned sampling grid in June (Period 5).

3.4 Sample processing on board

3.4.1 Plankton samples

As soon as the torpedo is back on board the vessel, the sample (Fig. 3.4) is brought to the hydrographic lab.



Figure 3.4. The codend with the plankton sample.

The fresh sample is immediately fixed in 4% buffered formaldehyde. After at least 24 hours of fixation, the fish eggs are separated from the other plankton using the 'spray method'. Eggs are photographed and identified to species using image analysis (Fig. 3.5). All eggs are counted and identified to species. For mackerel and horse mackerel eggs, per sample, at least one hundred eggs are measured and the development stage is determined. The remaining mackerel and horse mackerel eggs are counted. If the sample contains a lot of eggs these are all sorted from the sample, and then subsampled using a 'Folsom'-splitter ensuring at least 100 mackerel and horse mackerel eggs are staged.

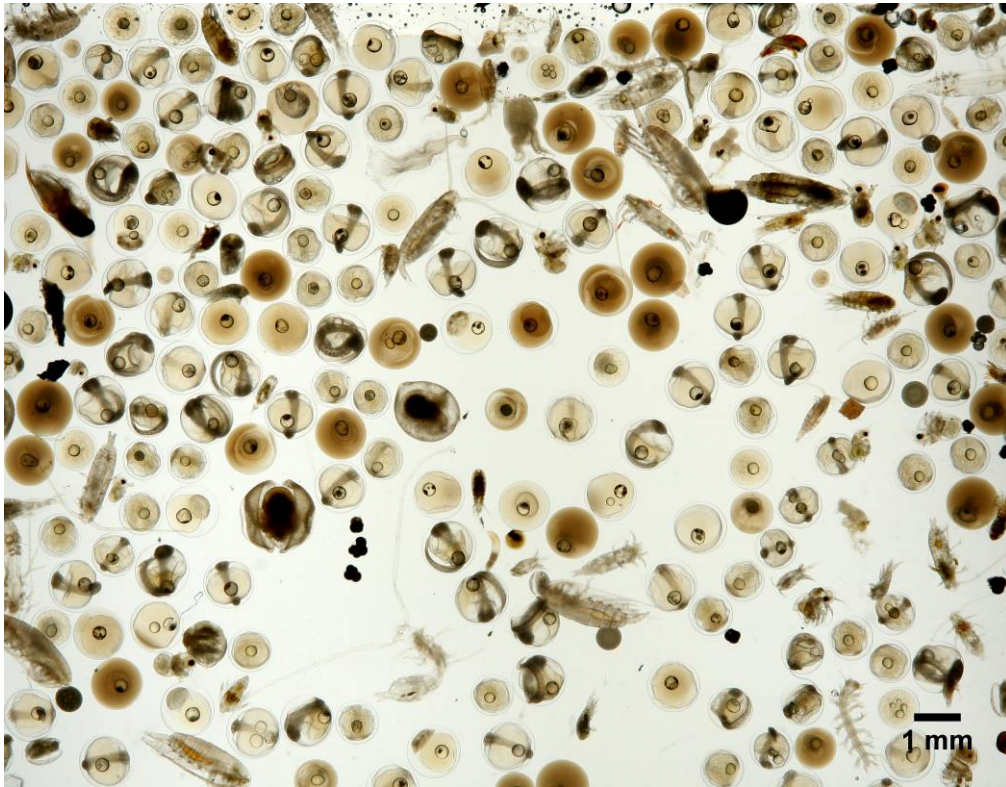


Figure 3.5. Mackerel and horse mackerel eggs with other plankton in a sample.

For quality assurance sorting of the samples is checked. Of each 'sprayer' 3 samples, with different total amounts of plankton, are checked to see if eggs are properly sorted. If > 5% of the total number of larvae and eggs remain in the samples, all samples of this person are checked and numbers adjusted. The samples from period 4 (May) are checked on board during period 5. The samples from period 5 will be checked in the laboratory.

3.4.2 Adult fish samples

In principal all the fish are put on the conveyor belt and the total catch weighed. All mackerel and horse mackerel and 100 boar fish are collected from the catch. Total weight of all mackerel and horse mackerel is measured. One hundred mackerel and horse mackerel are taken randomly from the catch. If less than 100 mackerel or horse mackerel are caught all are measured. Of each individual length, weight, sex and maturity are taken. From the 100 mackerel, females in development stage 3 to 6 are collected. In each period 60 female mackerel are sampled divided over all the trawl hauls. Of each female, length, weight, maturity, age, ovary weight, liver weight, stomach weight and guts weight is collected. Of the ovary one whole lobe is put in 3.6% formaldehyde for atresia sampling. From the other lobe 3 25 μ l pipette samples are collected and put in 3.6% formaldehyde. Also a teaspoon full of oocytes is collected for testing of a new atresia estimation method. Each haul stomachs of 10 mackerels are collected and frozen separately.

From the 100 horse mackerel, females in development stage 3 to 5 are collected. In each period 30 female horse mackerel are sampled divided over all the trawl hauls. Of each female, length, weight, maturity, age, ovary weight, liver weight, stomach weight and guts weight is collected. From the ovary 3 25 μ l pipette samples are

collected and put in 3.6% formaldehyde. Also a whole ovary lobe of 20 horse mackerels is put in 3.6% formaldehyde.

3.4.3 Fertilized eggs

While sorting out the catch, running mackerel and horse mackerel are separated. The gonads from the running males and females are extracted as soon as possible. Using alcohol and seawater rinsed scalpels the gonads are cut open and put in a sieve in clean sea water in order to fertilize hydrated eggs. After one hour the gonad remains are removed and the fertilized eggs are transferred to a clean sieve and put in the experimental tank with running seawater.

At the start of development fertilized eggs are sampled every few hours to ensure development stage 1B eggs are sampled. From development stage 2 sampling can be reduced but all stages should be collected up till hatching.

All eggs sampled are photographed on board and put into 4% formaldehyde solution.

3.5 Sample processing in the lab

3.5.1 Plankton samples

Samples from period 5 need to be checked for sorting.

3.5.2 Adult fish samples

The fecundity pipette samples are sent around to the analysing institutes as soon as possible upon return to the lab.

After fixation of at least 14 days in 3.6% formaldehyde the ovary lobes for atresia estimation are ready to be cut. From each lobe one or two whole sections (depending on the size of the ovary) of 0.5 cm thickness will be put in individual cassettes and sorted in 70% alcohol. These samples can then be sent around to the analysing institutes.

3.6 Calculation of the number of larvae and eggs

The total number of eggs in the water is calculated using the below formulas:

The volume filtered is obtained from the formula:

$$\text{Volume filtered} = \frac{\text{area of mouth opening (m}^2\text{)} * \text{efficiency factor} * \text{flowmeter revolutions}}{\text{flowmeter calibration constant}}$$

The numbers per square metre at each station can be calculated as:

$$n / m^2 = \frac{\text{larvae per sample (n)} * \text{sampler depth (m)}}{\text{volume filtered (m}^3\text{)}}$$

4 Results

Date and time

From (harbour)	Date	Time (UTC)	To (harbour)	Date	Time (UTC)
Scheveningen	03-05-2010	10:15	La Pallice	08-05-2010	12:00
La Pallice	10-05-2010	07:00	Brest	14-05-2010	14:00
Brest	16-05-2010	19:00	Fowey	20-05-2010	08:00
Fowey	31-05-2010	19:00	Lorient	05-06-2010	06:00
Lorient	07-06-2010	09:00	Brest	11-06-2010	15:00
Brest	13-06-2010	17:00	Scheveningen	18-06-2010	08:00

Crew: Cindy van Damme (cruise leader 03-05 – 06-06)
Kees Bakker (cruise leader 06-06 – 18-06)
Hans Wiegerinck
Silja Tribuhl
Ronald Bol

Volunteers

Guus Eltink
Stephan van Duin
Michiel Fransen

Guests

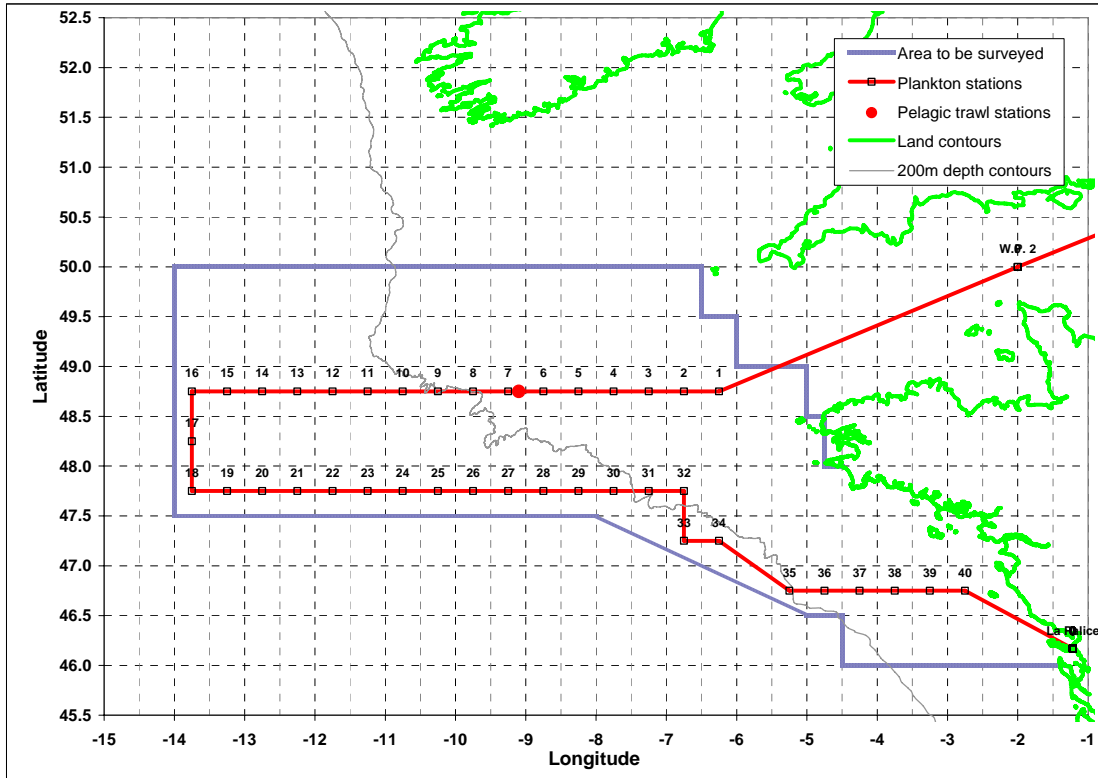
Björn Gunnarsson
Koos van Rijn

Deviations from the proposed sampling grid

In period 4 (May) the plankton stations were all sampled according to the proposed grid (Fig. 4.1). The pelagic hauls were moved according to the sightings on the echo sounder and Furuno.

In period 5 (June) all stations were sampled according to plan the first two weeks, but due to time constraints because of problems with the winch 8 stations could not be sampled in the last week. Due to this we could not sample the North-western corner of our sampling area and only the borders of the 49.45N transect (Fig. 4.2). As in period 4 the pelagic hauls were moved according to sightings on the echo sounder and Furuno.

Survey: Mackerel Horse Mackerel Egg Survey 2010 week 18 Period 4



Survey: Mackerel Horse Mackerel Egg Survey 2010 week 19 Period 4

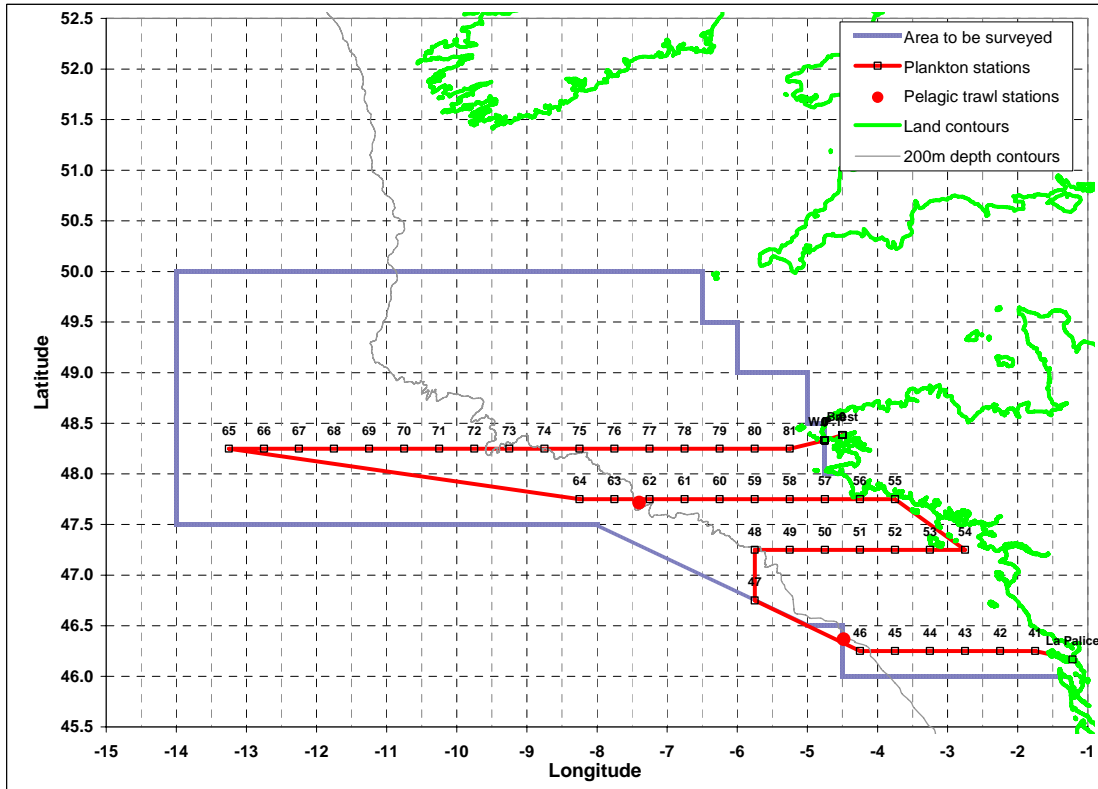


Figure 4.1. Sampled grids in period 4 May 2010.

Survey: Mackerel Horse Mackerel Egg Survey 2010 week 20 Period 4

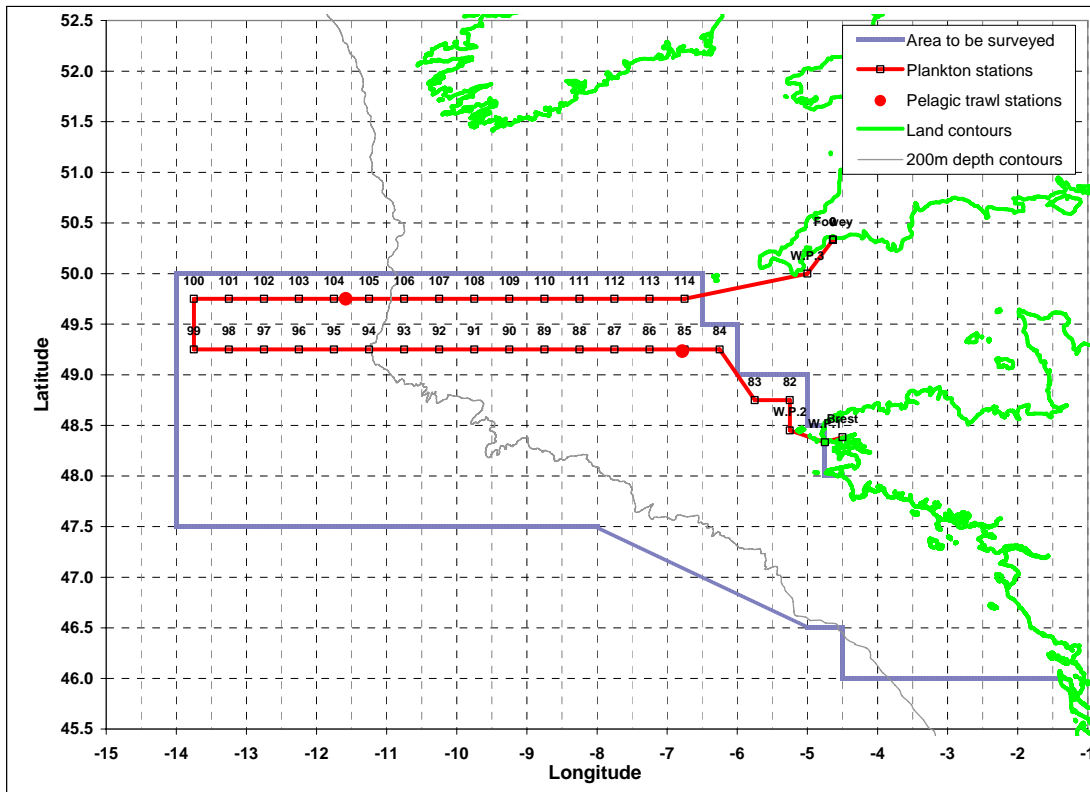


Figure 4.1 (continued). Sampled grids in period 4 May 2010.

Survey: Mackerel Horse Mackerel Egg Survey 2010 week 22 Period 5

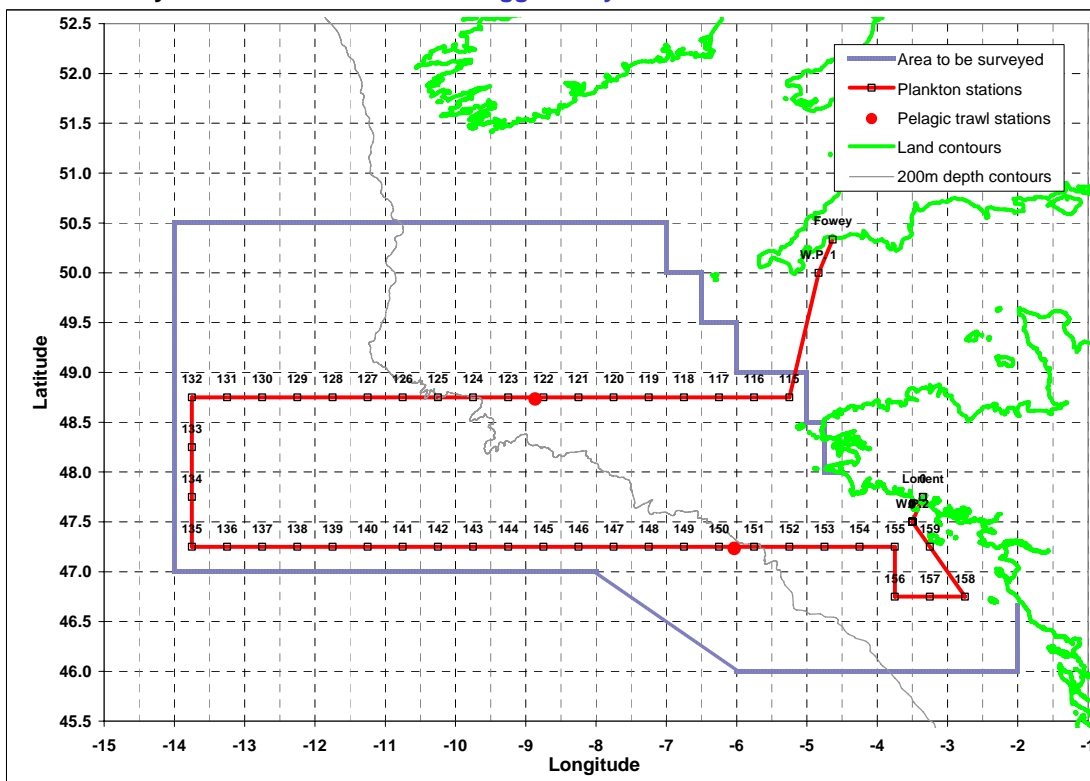
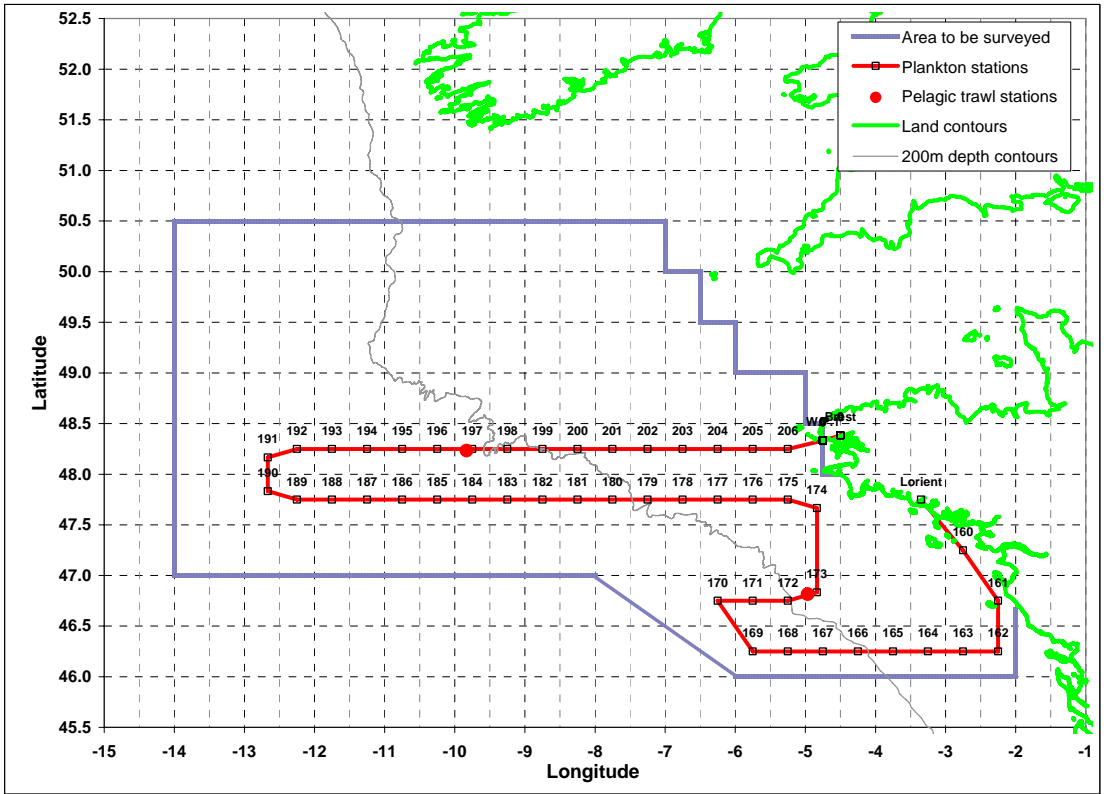


Figure 4.2. Sampled grids in period 5 June 2010.

Survey: Mackerel Horse Mackerel Egg Survey 2010 week 23 Period 5



Survey: Mackerel Horse Mackerel Egg Survey 2010 week 24 Period 5

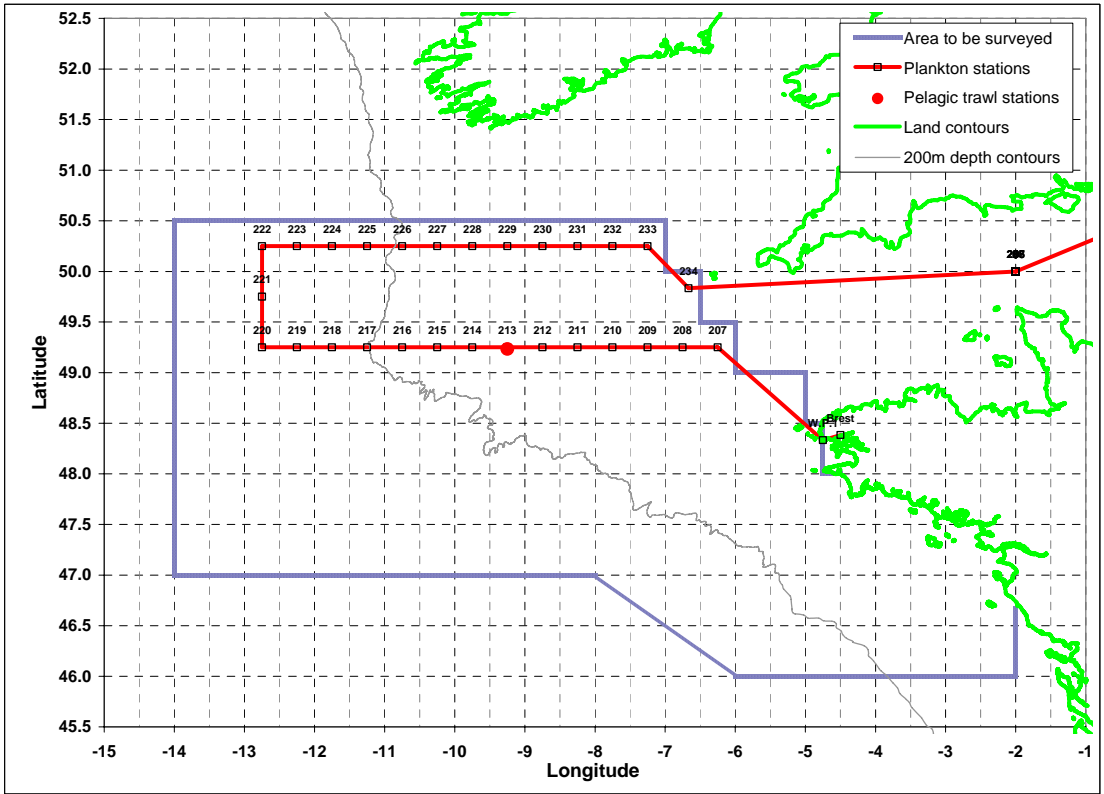


Figure 4.2 (continued). Sampled grids in period 5 June 2010.

Damage to sampling materials

No damage to the sampling gear occurred during this survey.

Survey

Week 18

Left Scheveningen harbour on Monday 3 May 2010 at 10:15 (UTC). Steaming west through the English Channel to the first station at 48.45N 6.15W. On Tuesday morning we performed a trial haul with the pelagic 5600 net to test the net sonar in the Western English Channel. We caught a few mackerel and lots of sardines. The mackerel had developing gonads but were not ready to spawn. The net sonar performed OK. In the afternoon we did a tow with the Gulf 7 torpedo to calibrate the flowmeters.

We arrived at the first station on 4 May 20:42 (UTC). Fishing with the Gulf 7 torpedo was all right.

At station number 4 (48.45N 7.45W) the sieve broke and some of the plankton may be lost.

On 5 May at 7:35 we did a pelagic trawl haul. The total catch was 10 tonnes and consisted of boarfish, mackerel, horse mackerel and hake. We had running mackerel females and males and fertilized eggs.

We had problems getting the torpedo to 200m depth. Therefore we changed the depressor to 35 kg a station 11 (48.45N 11.15W).

Early in the morning of the 6th May the winches broke down. We lost about one hour but are gaining time on the planning. Due to this problem the power to the pump generating the salt water flow to the experimental tank was lost. This problem was discovered later in the morning (7.45 UTC). The eggs remained without fresh water for some hours and as a result died.

The remaining time plankton sampling was fine. We sailed into La Pallice harbour 8 May at 12:00 (UTC).

During the week the cable of the portside winch was prepared and during the weekend we switched from starboard side to portside winch.

We caught few mackerel and horse mackerel eggs this week.

Week 19

Left La Pallice harbour on Monday 10 May at 7:00 (UTC). We sampled our first station (46.15N 1.45W) at 9:00. In the evening of the 10th of May we performed a pelagic haul at dusk at 46.22N 4.29W. The total catch was 2 tonnes and consisted of horse mackerel, blue whiting and hake. We caught running horse mackerel and were able to fertilize eggs.

Wednesday morning at station 62 (47.45N 7.15W) we changed the rubber ring of the torpedo. At the next station we decreased the pull of the stop bag to be able to reach 200 m depth.

At 47.43N 7.24W we did another pelagic trawl haul. Total catch was 6 tonnes and consisted of hake, horse mackerel and few mackerel. No running females were caught this time.

On Thursday 13th of May we switched again to the starboard winch. Since station 65 we are experiencing problems with the internal flowmeter. We changed the cable and nose cone on the torpedo and since the net was dirty we changed this as well. After the changes we performed another calibration haul, during which the flowmeters both performed OK. After the calibration the flow meter deck unit was changed. It turned out that the connection for the external and internal flowmeters were different in this deck unit. However the flowmeters recorded correctly so we needed only to switch the data for these hauls and switched the connection in the deck unit.

We finished our planned stations for this week and arrived in Brest harbour Friday at 14:00 (UTC)

Horse mackerel eggs developed well and larvae hatched on Friday. Eggs in all development stages were collected.

Week 20

Left Brest on Sunday evening 16 May at 19:00 (UTC). We reached our first station (46.15N 1.45W) at 23:39 (UTC). Sampling plankton stations went according to plan this week. No (technical) problems were encountered.

On Monday we did a pelagic haul (49.14N 6.47W) at 07:07 (UTC). The total catch was 2.5 tonnes and consisted of mackerel and herring. No spawning mackerel were caught.

Tuesday evening we fished the last pelagic haul of period 4 (49.45N 11.35W) at 20:24 (UTC). A small catch of 65 kg containing mackerel and horse mackerel and some deep sea species. Few spawning mackerel and horse mackerel were found but since it was near the end of the survey no eggs were fertilized.

Wednesday 19 May at 13:24 we fished the last plankton station at 49.43N 6.43W. After this we steamed to Fowey harbour. Arrived in Fowey on Thursday 20 May at 08:00 (UTC).

Week 22

Left Fowey harbour on Monday 31 May 2010 at 19:00 (UTC). Steaming west through the English Channel to the first station at 48.45N 5.15W. We arrived at the first station on 1 June 1:56 (UTC). Fishing with the Gulf 7 torpedo went all right. On some of the stations on the continental plateau we encountered strong thermoclines and this reduced sampling time.

On 1 June at 19:00 we did a pelagic trawl haul. The total catch was 1000 kg and consisted of boarfish, blue whiting, mackerel, horse mackerel and hake. No running mackerel or horse mackerel were caught.

On Wednesday the plankton sieve broke and one sample 5400220 was washed away.

On Friday morning we did another pelagic haul in the dark at 1:45 (UTC). We had a big catch of 40 tonnes in total. However almost 90% of the catch consisted of boarfish. Also some horse mackerel and mackerel as well as greater argentines were caught. Enough mackerel and horse mackerel for a good adult sample. We did not catch running mackerel or horse mackerel so were not able to fertilize eggs.

The remaining time plankton sampling was fine. The stations on the continental plateau again had strong thermoclines.

During this week we were able to work up and identify all plankton samples from the second period. We also checked if the samples from the first period were sorted correctly. The results show that at the beginning of the survey samples were not all sorted properly. These were sorted again and remaining eggs were identified as well.

We sailed into Lorient harbour 5 June at 6:00 (UTC).

Week 23

Left Lorient harbour on Monday 7 June at 09:00 (UTC). Three hours delay due to an accident of one of the crewmembers during the weekend. We sampled the first station at 11:45 (UTC). Calm weather in the beginning of the day, later cloudy and windy from the west, force 6. Four plankton stations sampled this day.

Tuesday 8 June at 13:00 (UTC) we performed a pelagic haul. The total catch was a mixture of 2.5 tons of blue whiting, hake and horse mackerel. At plankton station 173 we chanced the external flow meter cable. 10 plankton stations were sampled. Weather conditions were moderate to good. Wind force 3 to 4 WNW.

On Wednesday 13 plankton stations were sampled. The weather conditions became poor during the day. Wind force 5 to 6 from north-westerly direction. Later during the night force 7 to 8. On Thursday 11 plankton stations were sampled and another pelagic haul 13.30 (UTC). The total catch was 1800 kg and consisted of young blue whiting and horse mackerel. The weather conditions during the day were poor. Wind force 6 to 7 from northerly direction. Friday 11 June 6 plankton stations were sampled. The weather conditions increased during the day.

This week plankton sampling was fine. The stations on the continental plateau again had strong thermoclines.

During this week we were able to work up and identify all plankton samples from this period.

We sailed into Brest harbour 11 June at 15:00 (UTC).

Week 24

Left Brest harbour on Sunday 13 June at 19:00 (UTC). Steaming North-west to the first station at 49.15N 6.17W. Strong wind from the North force 6 to 7 later improving 4 to 5. We arrived at the first plankton station on 14 June 1:02 (UTC). Fishing with the Gulf 7 torpedo went all right. On some of the stations on the continental plateau we encountered strong thermoclines and this reduced sampling time considerably. On 14 June at 2:00 (UTC) we also performed a pelagic trawl haul. The total catch was 2000 kg and consisted of boarfish, mackerel, horse mackerel and some hake. Also 11 plankton stations were sampled.

On 15 June at 03:17 (UTC) at station 219 we encountered problems with the starboard winch due to which the sampling of station 219 was invalid. We had to switch to the portside winch and could therefore not resample this station. At 06:30 (UTC) we continued with plankton station 220. The weather conditions were good, wind force 3-4 from the north-east. This day 13 plankton stations were sampled. On 16 June we skipped 4 stations on the west-side of the transect due to the time lost because of the winch problems. At 09:34 (UTC) we sampled the last plankton station 234. The weather conditions were good, wind force 2-3 from the north-east. After an additional calibration haul we set sail to Scheveningen.

During this week we were able to work up and identify all plankton samples from the second period. We also checked if the samples from the second period were sorted correctly. The results were fine and no extra sorting was necessary.

Sample-id's

Plankton hauls 2010.5400101 - 2010. 5400334

Pelagic trawl hauls 2010.5400351 – 2010.5400360

Samples and data

During this period a total of 234 plankton stations with CTD measurements, 10 pelagic hauls and 6 calibration tows were performed covering the whole of the proposed sampling area. At each plankton station a double oblique haul was performed and minimum sampling time was 10 minutes. Due to an accident during sorting 2 plankton samples were lost.

Remarks for the next surveys

During the last week of the survey the winch was paid out too far by accident. Due to this the electronic cable was damaged and part of it had to be cut off, hence the cable is too short for the next Atlantic mackerel survey. The cable on the port side winch was already too short to reach 200 m depth. It is therefore necessary to buy new cables for both winches for the 2013 survey. We highly recommend to purchase new cables of at least 1200 m length to ensure enough cable for the sampling depth.

5 Results

5.1 Mackerel eggs

Numbers of mackerel eggs found in the samples in both periods, May and June, were low compared to the previous survey in 2007 (Fig. 5.1 - 5.4). However reports from other institutes showed that mackerel spawning started already in April in the Bay of Biscay and Celtic Sea and moved north early this year. Numbers found in June were higher compared to May. Highest numbers were found around the 200m depth contour.

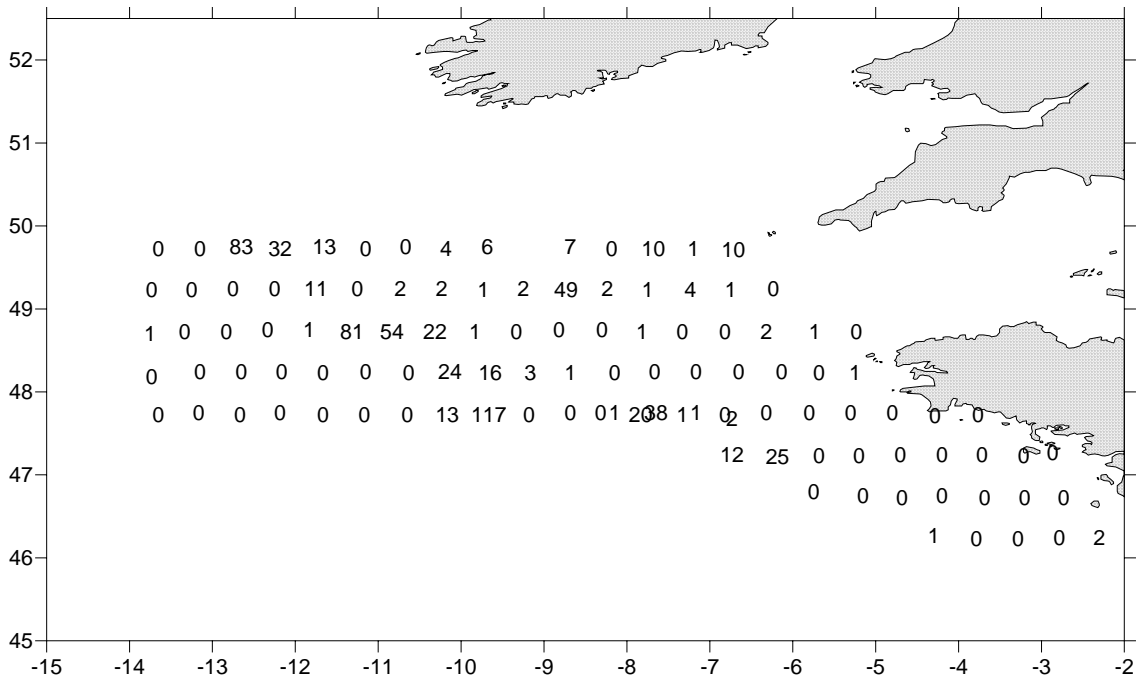


Figure 5.1. Total numbers of mackerel eggs in period 4, May, in the samples.

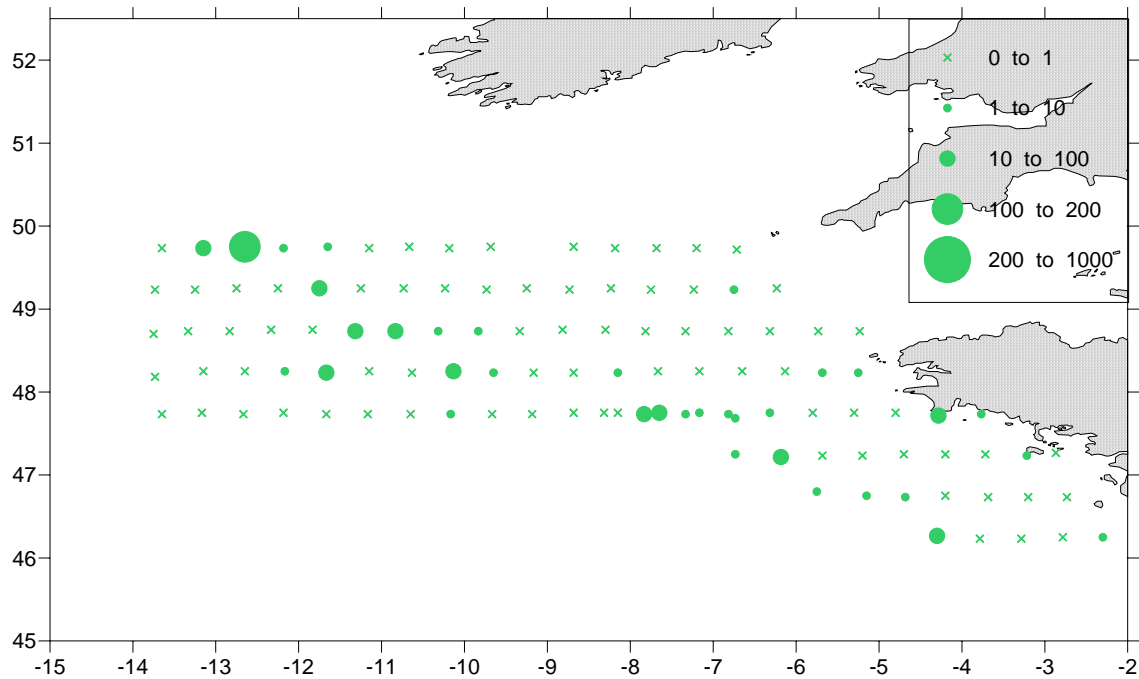


Figure 5.6. Numbers of horse mackerel eggs per m² in period 4, May, in the samples.

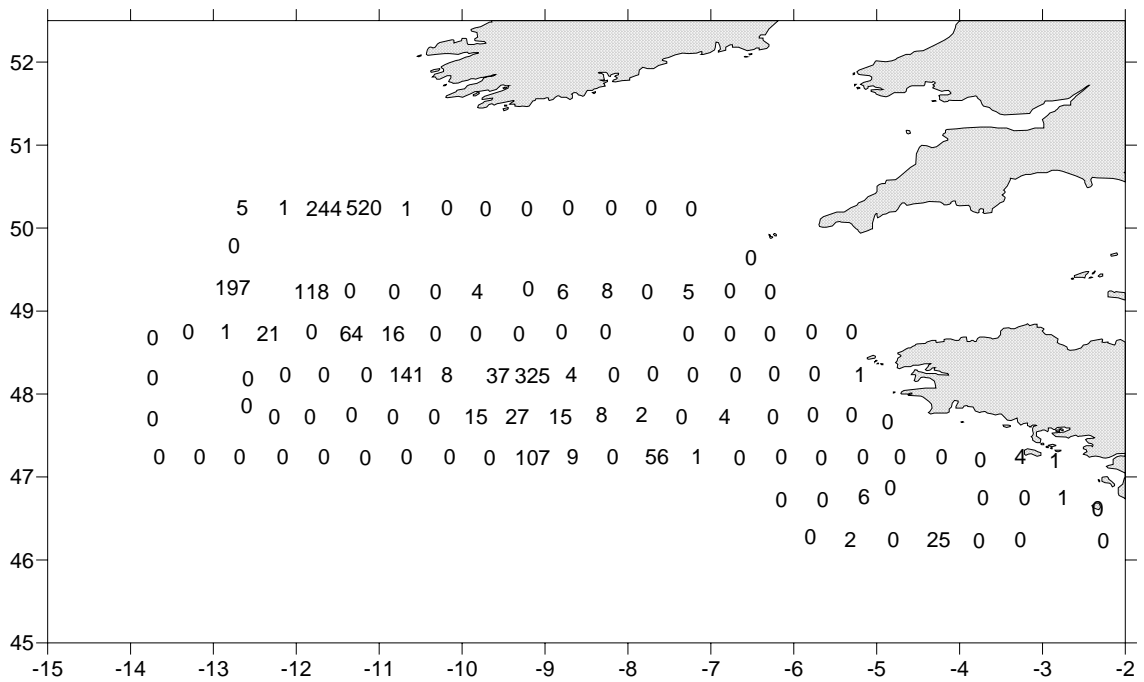


Figure 5.7. Total numbers of horse mackerel eggs in period 5, June, in the samples.

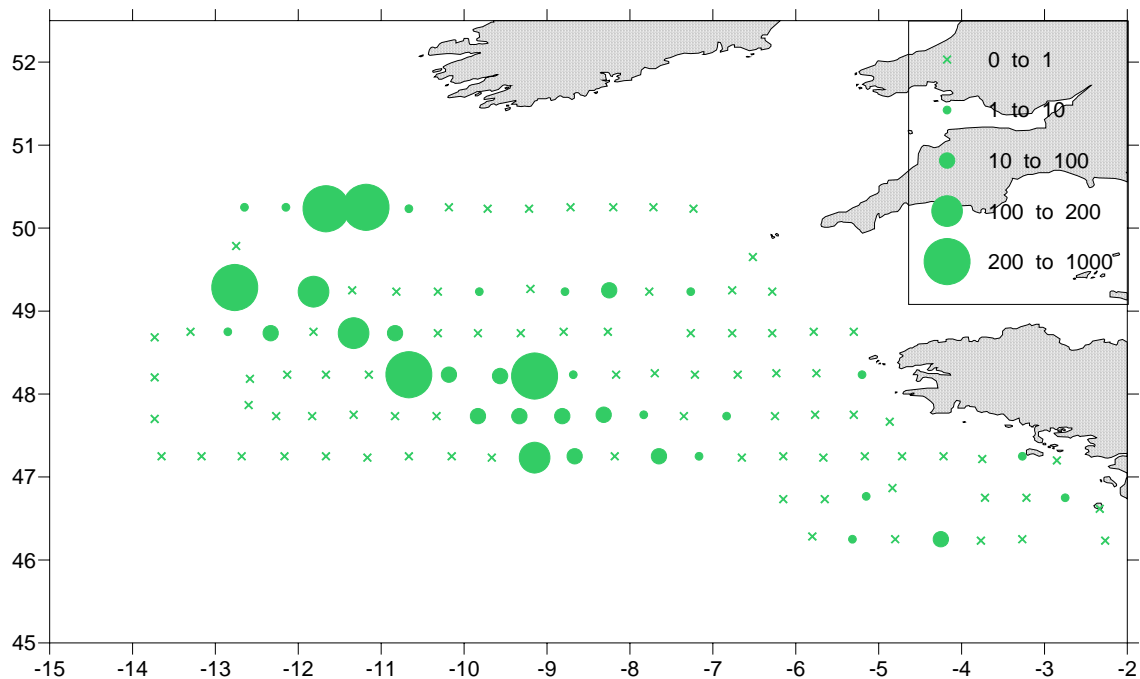


Figure 5.8. Numbers of horse mackerel eggs per m² in period 5, June, in the samples.

5.3 Adult fish samples

We did a total of 10 pelagic trawl hauls, 5 in each period. Of these 7 contained mackerel and 9 contained horse mackerel. We managed to collect all female ovary samples we were asked to take. The samples were divided over the different tows.

5.4 Fertilized eggs

In May we managed to perform some pelagic hauls when it was dark. These hauls contained both running mackerel and horse mackerel. We managed to fertilise mackerel eggs. However due to a failure of the flow of salt water and oxygen these died and we were only able to collect stage 1A eggs. In the same period we also managed to fertilize horse mackerel eggs. These survived until hatching and we were able to collect eggs in all the development stages.

5.5 Hydrographical data

Temperatures in May at both the surface (5 m) and 20 m depth were lower compared to June (Fig. 5.9 – 5.12). In May no thermoclines were seen at the plankton stations, while in June most stations on the continental plateau showed a strong thermocline just below 20 m depth.

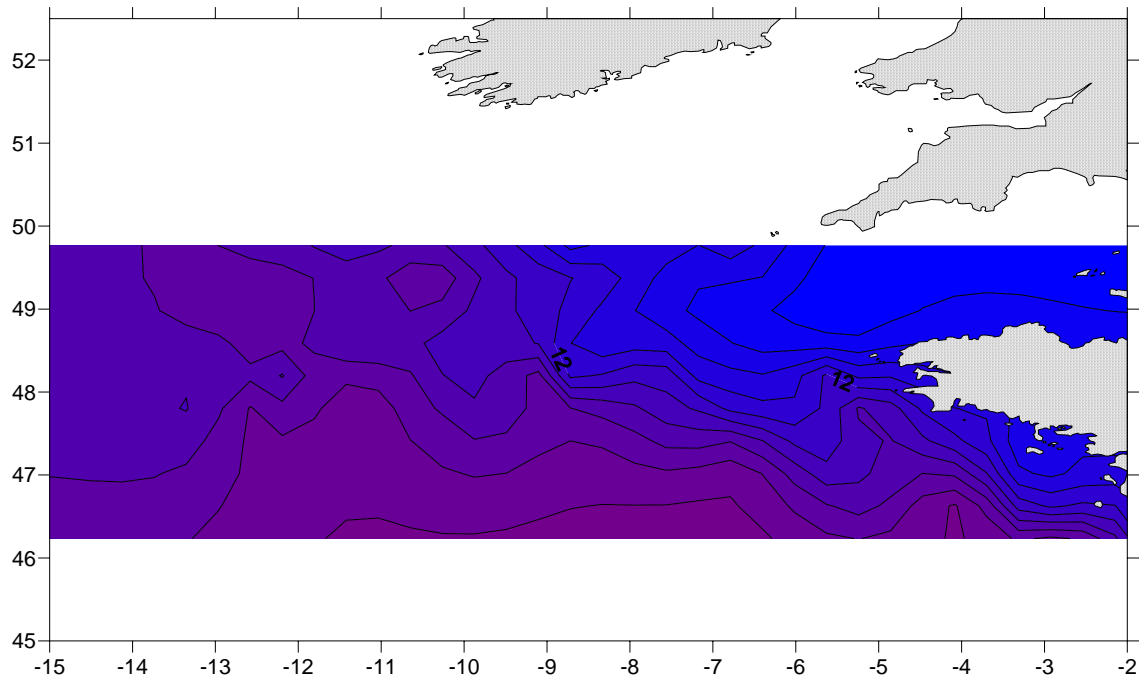


Figure 5.9. Temperature at the surface (5 m) during period 4, May.

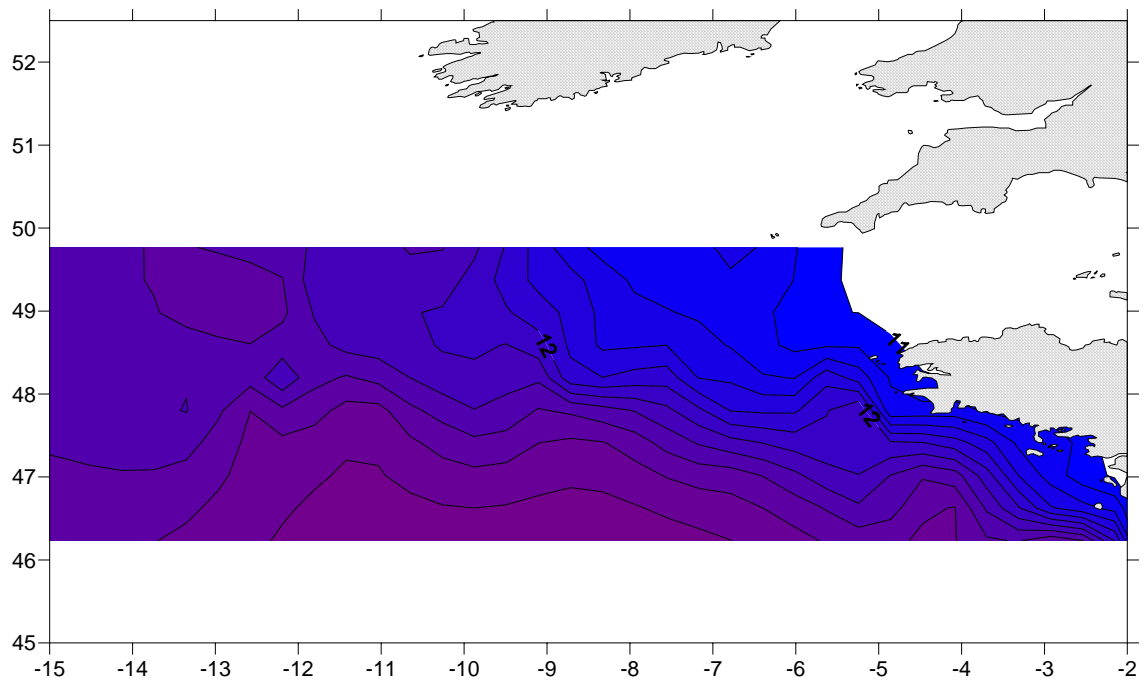


Figure 5.10. Temperature at 20 m during period 4, May.

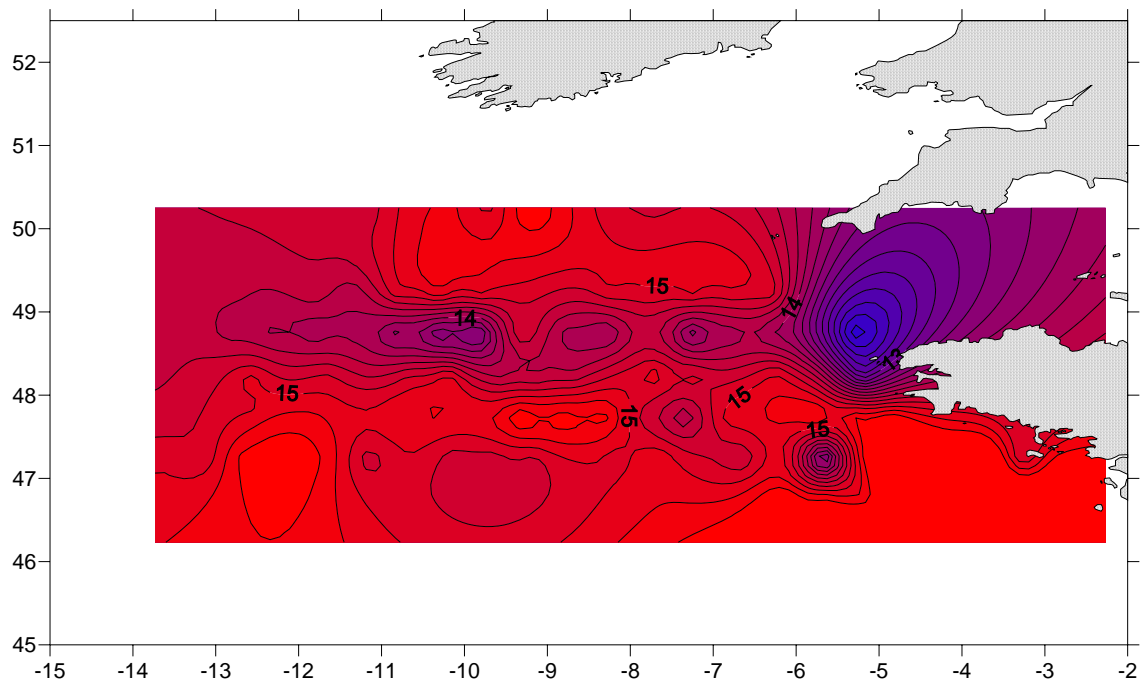


Figure 5.11. Temperature at the surface (5 m) during period 5, June.

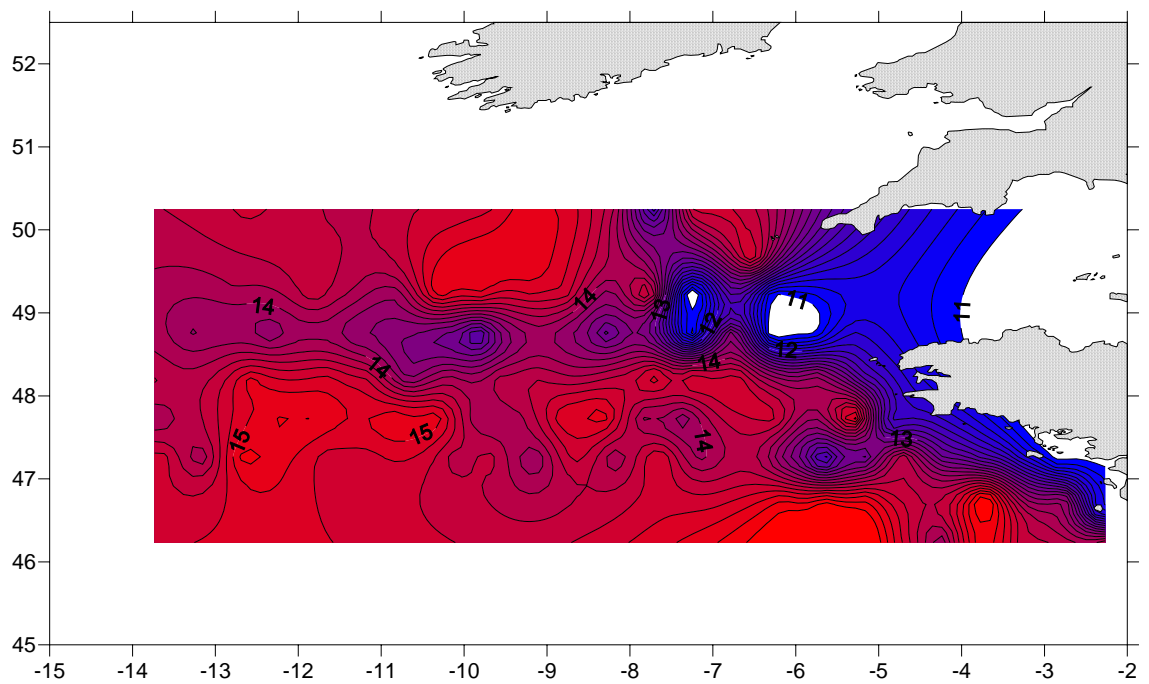


Figure 5.12. Temperature at 20 m during period 5, June.

Salinity pattern at 20 m depth was comparable in both May and June (Fig. 5.13 – 5.14).

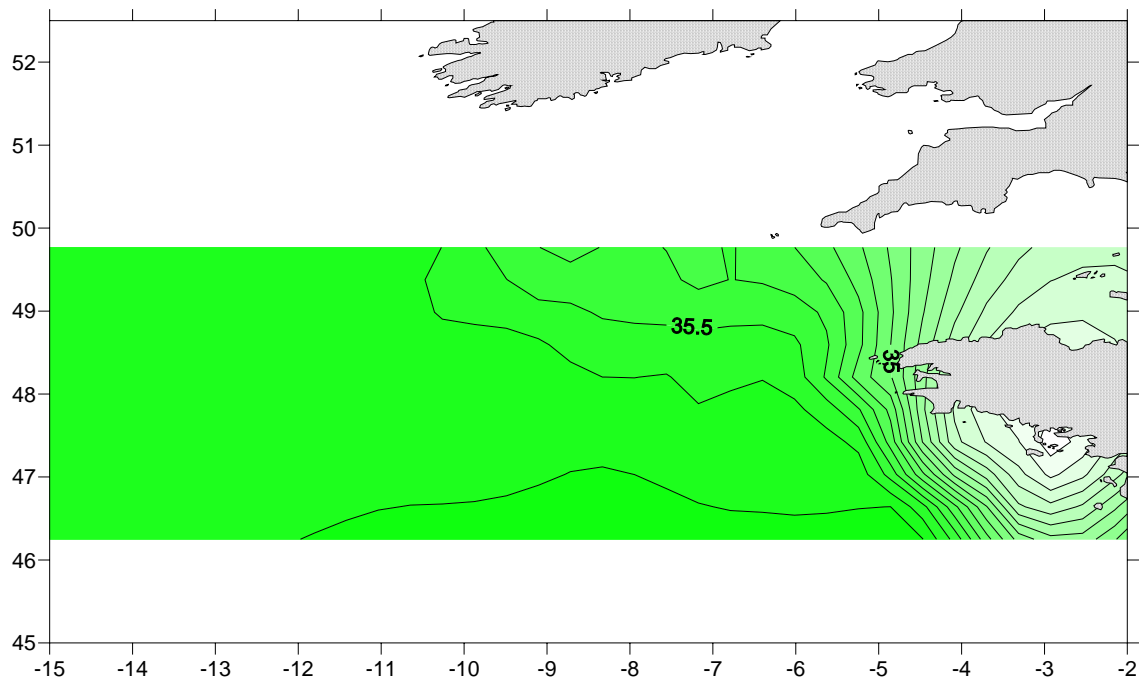


Figure 5.13. Salinity at 20 m during period 4, May.

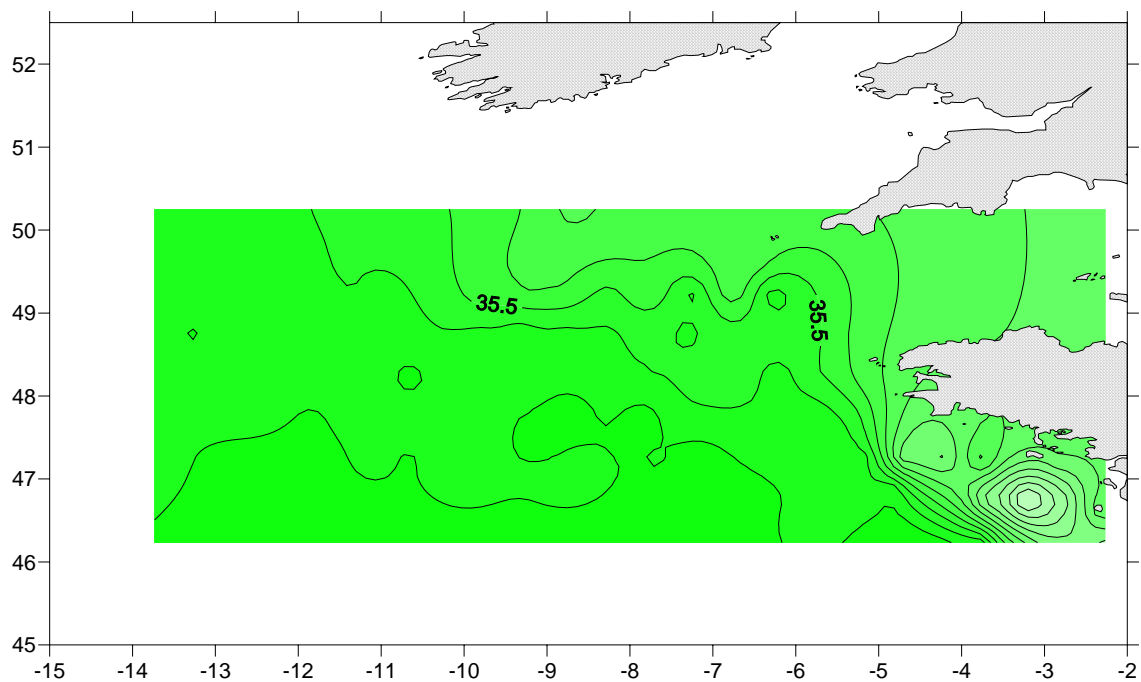


Figure 5.14. Salinity at 20 m during period 5, June.

5.6 Publication

During period 4 (May) a free lance journalist, Stephan van Duin, joined the survey as a volunteer. He has published an article about his experience on board the 'RV Tridens' and the international mackerel egg survey in the Dutch journal 'Bionieuws' (see also attachment 1).

6 Exchange with Icelandic colleagues

During the 2010 mackerel and horse mackerel egg survey, Marine Research Institute, Iceland, participated in the survey for the first time. We therefore agreed upon an exchange of staff to learn and help setup the survey on board the Icelandic research vessel 'RV Árni Friðriksson' (Fig. 6.1).

Björn Gunnarsson joined the 'RV Tridens' from 3 till 8 May. Cindy van Damme joined the 'RV Árni Friðriksson' from 9 till 16 June. While it is always a pleasure to be on board other vessels this exchange also gave the opportunity to see two different plankton samplers deployed, Gulf VII on the 'RV Tridens' and Bongo on board 'RV Árni Friðriksson' (Fig. 6.1). These exchanges of staff between vessels are highly educational and should be encouraged in future surveys.

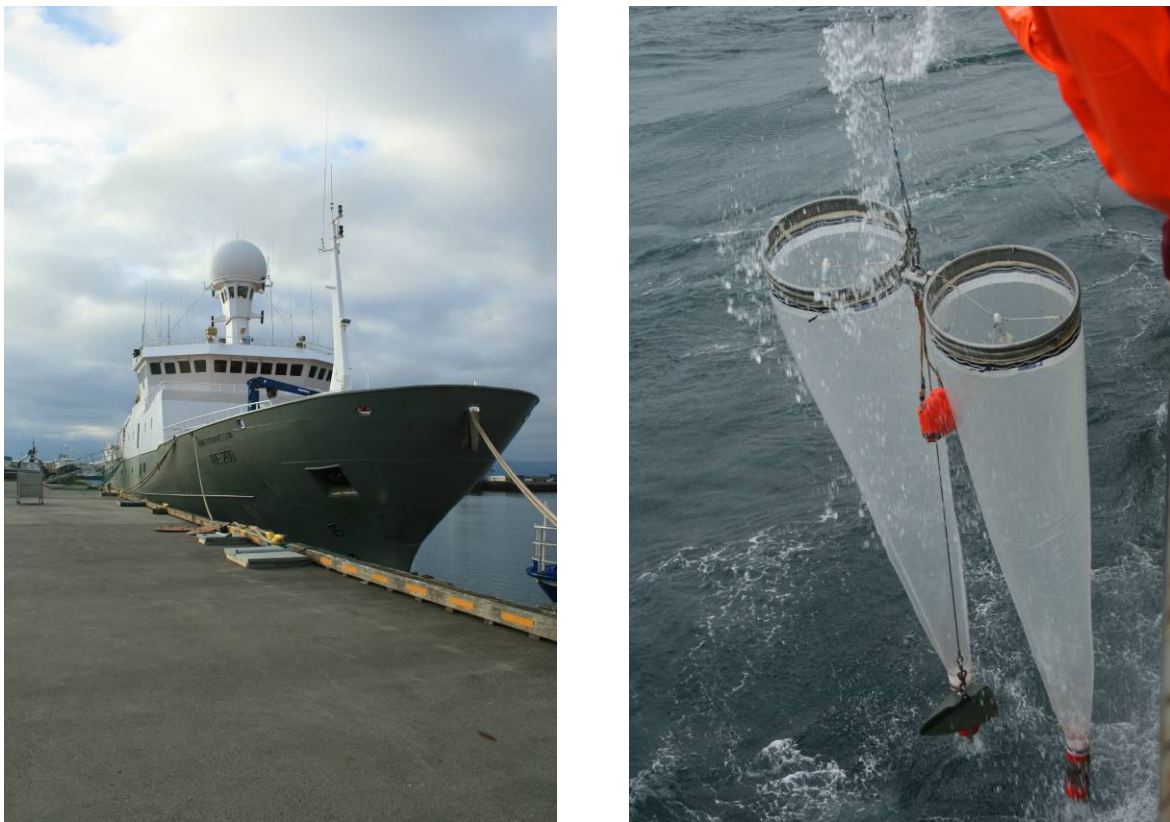


Fig. 6.1 'RV Árni Friðriksson' and the bongo net used on board the vessel.

7 Acknowledgements

We would like to thank the crew of 'RV Tridens' for a pleasant stay on board and their cooperation with the plankton and adult fish sampling, and allowing us to fish with the pelagic trawl during the night. These night hauls have given us the prove that horse mackerel do spawn at night, and probably for the first time we have been able to take horse mackerel fecundity sampled with spawning markers.

We would also like to thank all the volunteers, Stephan van Duin, Michiel Fransen and Guus Eltink for their much appreciated support and help during the survey. Stephan also wrote a publication for Bionieuws about the mackerel egg survey and his findings on board the 'RV Tridens'.

We would like to thank the Marine Research Institute, Reykjavik, Iceland, for the exchange of staff. Björn Gunnarsson's help on board the 'RV Tridens' was much appreciated. Thanks to all the crew of 'RV Árne Friðriksson' and MRI scientists, Björn Gunnarsson, Konrad Thorisson and Agnes Eydal, for a most pleasant and interesting stay on board their vessel.

8 Quality Assurance

8.1 Check on the sorting of the samples

For quality assurance sorting of the samples is checked. All participants on the survey are required to use the 'spray' technique on two samples with know numbers of eggs before going to sea. After the survey, of each plankton-'sprayer' at least 3 samples, with different total amounts of plankton, are checked if eggs are properly sorted. If > 5% of the total number of eggs remain in the samples, all samples of this person are checked and numbers adjusted.

8.2 ISO

IMARES utilises an ISO 9001:2000 certified quality management system (certificate number: 08602-2004-AQ-ROT-RvA). This certificate is valid until 15 March 2010. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V. Furthermore, the chemical laboratory of the Environmental Division has NEN-AND-ISO/IEC 17025:2005 accreditation for test laboratories with number L097. This accreditation is valid until 27 March 2013 and was first issued on 27 March 1997. Accreditation was granted by the Council for Accreditation.

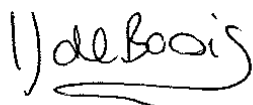
Justification

Rapport C078/10
Project Number: 430.12110.24

The scientific quality of this report has been peer reviewed by a colleague scientist and the head of the department of IMARES.

Approved: Ingeborg de Boois
Project leader WOT Surveys

Signature:



Date: 30 June 2010

Approved: Jakob Asjes
Head of department Vis

Signature:



Date: 30 June 2010

Number of copies: 13
Number of pages: 33
Number of tables: 0
Number of graphs: 23
Number of appendix attachments: 1



elken apart gehouden voor het onderzoek, de rest gaat weer overboord. De rode visjes zijn oevervis, een vedvoorkomende planktonsoort met makreel- en horsmakreel-eieren en andere organismen.

Van visstand naar visquotum

Wij zijn drie weken op pad geweest om de makreel- en horsmakreelstand te bepalen, in slechts een klein deel van de Europese wateren. Het is dus niet lastig voor te stellen dat het verkrijgen van dergelijke informatie voor alle commerciële vissoorten in alle Europese wateren nogal wat voeten in de aarde heeft. Om al die informatie over visstanden goed te kunnen verwerken en geschikte visquota te kunnen formuleren, wordt het onderzoek gecoördineerd door ICES, ICES, the International Council for the Exploration of the Seas, brengt naar aanleiding van de onderzoeksresultaten adviezen uit aan de Europese Commissie, die de visquota vaststelt op basis van deze adviezen. De ICES adviezen komen als volgt tot stand. Cindy van Damme legt uit: 'Ieder land neemt in principe deel aan het onderzoek naar de soorten waarvoor het een quotum heeft. De onderzoeken worden opgedeeld in groepen van biologisch vergelijkbare vissoorten. Zo hebben makreel en horsmakreel overlappende paaigebieden en paaijijd; ze worden dan ook tegelijk onderzocht.' De aan de makreel- en horsmakreel survey deelnemende landen zijn Spanje, Portugal, Ierland, Schotland, Nederland, Duitsland, Noorwegen, de Faeröer eilanden en IJsland. Deze landen bemonsteren gezamenlijk de totale paaiperiode van februari tot juli, en het totale paaigebied.

De beschreven onderzoeksmethode levert een schatting op van de visstand in het gehele paaigebied. Op basis van het voortplantingssucces en de overgang van juveniele vis naar het paaibestand - het volwassen worden van jonge vis - wordt een minimum populatiegrootte bepaald. Als de aantallen daar onderzakken, kan de soort niet voortbestaan. De onderzoeksgroepen leveren hun gegevens in bij een zogenaamde assessmentgroep, ook onderdeel van ICES. Die combineert de surveygegevens met commerciële vangstgegevens van verschillende soorten, en formuleert een advies voor mogelijke visvangst op basis van

deze data. De adviezen van de verscheidene assessmentgroepen komen terecht bij ACOM, de wetenschappelijke adviescommissie van ICES die alle adviezen combineert. ACOM doet ook een controle, waarbij haar wetenschappers kritisch naar de verschillende onderzoeken kijken. Op basis van deze controle kan ACOM besluiten sommige onderzoeken uit te sluiten. Tenslotte werkt ACOM het wetenschappelijke werk van de surveygroepen op tot een advies. Van Damme: 'Dit advies stelt hoeveel vis bij een bepaalde visserijdruk kan worden weggevangen, zodat het bestand boven de minimale populatiegrootte blijft.' In het getal voor de visserijdruk zijn bestaande quota en eventuele bijvangst verwerkt.

'Ieder land neemt in principe deel aan het onderzoek naar de soorten waarvoor het een quotum heeft'

ACOM presenteert haar adviezen aan de Europese Commissie. Die laat het Europees Wetenschappelijk, Technisch en Economisch comité voor de visserij wederom een kwaliteitscontrole uitvoeren. Vervolgens stuurt de Commissie de adviezen door naar de individuele lidstaten. In Nederland gaan ze dus - nu nog - naar Gerda Verburg van het ministerie van LNV. Nu verlaten de voorgestelde adviezen het wetenschappelijk domein en begint het politieke proces van quota-onderhandelingen. Tijdens dit proces probeert de visserijsector de quota zo te beïnvloeden, dat hun vangsten gemaximaliseerd worden, zonder dat er biologische schade aan de soort ontstaat. Met de Atlantische makreelpopulatie gaat het momenteel goed, voor deze soort leveren de onderhandelingen doorgaans dan ook weinig problemen op.

bemanningsloos het net in het ruim en de vis wordt over lopende banden weer overboord gewerkt. Langs de lopende band staan we gezamenlijk de makreel en andere gewenste soorten uit te sorteren. De gehele makreevangst wordt gewogen en een willekeurige selectie van honderd makrelen wordt nog eens individueel gewogen en opgemeten. Gespecialiseerde onderzoekers als Van Damme bepalen ook nog het geslacht en het stadium van volwassenheid. Is de vis nog juveniel, of is hij al volwassen? Zijn de geslachtsorganen gevuld met eieren of zaad - paairijp, of zijn ze uitgeleegd? In dat geval heeft de vis al gepaaid. Aan de hand van gehoorsteentjes bepalen de onder-

zoekers de leeftijd van de vis. Van de paairijpe vrouwtjes nemen ze tenslotte een kuiltmonster. Met deze data berekent Van Damme het aantal vrouwtjes dat de totale hoeveelheid eieren in de zee heeft geproduceerd en de verhouding tussen paairijpe vrouwtjes en mannetjes. Alle Europese instituten combineren hun waarden met elkaar, zodat een compleet beeld ontstaat van de Europese wateren. Cindy van Damme: 'Nadat het onderzoek is afgerond geeft het totale aantal eieren in de zee in combinatie met het aantal eieren per vrouwtje en de seksverhouding een goede schatting van het aantal volwassen makrelen in dat stuk oceaan.'

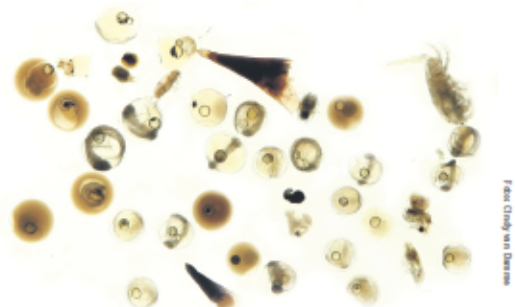


Foto: Cindy van Damme